DOCUMENT RESUME

ED 475 301 PS 031 191

AUTHOR	Xiang, Zongping; Schweinhart, Lawrence J.
TITLE	Effects Five Years Later: The Michigan School Readiness Program Evaluation through Age 10.
INSTITUTION	High/Scope Educational Research Foundation, Ypsilanti, MI.
SPONS AGENCY	Michigan State Board of Education, Lansing.
PUB DATE	2002-01-03
NOTE	43p.
AVAILABLE FROM	High/Scope Press, Educational Research Foundation, 600 North River Street, Ypsilanti, MI 48198-2989. Tel: 734-485-2000; Fax: 734-485-4467; Web site: http://www.highscope.org.
PUB TYPE	Reports - Evaluative (142)
EDRS PRICE	EDRS Price MF01 Plus Postage. PC Not Available from EDRS
DESCRIPTORS	*Academic Achievement; Comparative Analysis; *Early Intervention; *Elementary School Students; Followup Studies; Longitudinal Studies; Outcomes of Education; *Preschool Education; *Program Effectiveness; Program Evaluation; *School Readiness; Standardized Tests

ABSTRACT

This follow-up study examined the outcomes of children who had participated in the Michigan School Readiness Program (MSRP), a preschool program for 4-year-olds identified as being at risk for school failure, up to 5 years following their participation in the program. For the evaluation, 338 children who had participated in the state-funded preschool program and 258 comparison children of similar age and socioeconomic status who did not participate were followed from their entrance into kindergarten in 1996 through fourth grade. The evaluation sites were in and around Detroit, Grand Rapids, Grayling, Kalamazoo, Muskegon, and Port Huron. Compared to nonparticipating classmates at the beginning of kindergarten, children who had completed the MSRP were found by observers to be significantly more advanced in language and literacy, creative representation, music and movement, initiative, and social relations. Their parents were also more involved in their children's school activities and talked with their teachers more frequently. From kindergarten through fourth grade, children who had attended the MSRP were found by their elementary teachers to be: significantly more ready to learn than their nonparticipating classmates; more interested in school; more likely to have good attendance, take initiative, and retain learning; stronger in reading, mathematics, thinking, and problem-solving skills; and better at working with others. Compared to classmates of similar age and socioeconomic background who did not attend, 24 percent more MSRP participants passed the Michigan Educational Assessment Program literacy test for grade 4, and 16 percent more passed the mathematics test. Thirty-five percent fewer participants needed to repeat a grade. (Three appendices detail data analysis procedures.) (KB)

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Effects Five Years Later:
The Michigan School Readiness Program Evaluation Through Age 10

January 23, 2002

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Prepared For the Michigan State Board of Education

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CONTENTS

Executive Summary i

Review of the Study and Its Design. 1
- The Michigan School Readiness Program. 1
- The MSRP Evaluation's State Longitudinal Study. 2
  - Research Questions. 2
  - Study Participants. 2
  - Measures and Data Collection. 7
  - Data Analysis. 8

Major Findings 10
- MSRP Program Quality. 11
- MSRP and Children's Developmental Level at Kindergarten. 12
- MSRP and Children's School Readiness Status From Kindergarten Through Grade 4. 14
- MSRP and Held-Back Rates From Grade 1 Through Grade 4. 19
- MSRP and Children's Academic Performance at Grade 4 21
- MSRP and Special Services Children Received From Kindergarten Through Grade 4. 24
- MSRP and Parent Involvement and Expectations 25
- Relationship Between Parent Involvement and Children's School Readiness 27
- Summary of the Major Findings. 29

Conclusion 30

References 31

Appendix: 32
- Procedures to Minimize Missing Data on Grade-Level Status 32
- Compiling Parent Variables From Three Years of Data 32
- Compiling Socioeconomic Variables From Two Years of Data 34

TABLES AND FIGURES

Tables

1. Number of Study Participants by Study Group and Site 4
2. Child Characteristics and Socioeconomic Status by Study Group 5
3. Key Background Variables Selected in Adjusted Analyses for MSRP Effects 9
4. Aspects of MSRP Program Quality for the Sample Classrooms in 1995–1996 11
5. COR Scores by Group and Results of Testing for Group Difference 13
6. Grade 4: Teacher Ratings on School Readiness Rating Scale 15
7. Factor Loadings of SRRS Items on Factor 1 and 2 Across Grades 16
8. Factor Scores of the School Readiness Rating Scale by Group and Grade 17
9. Ready to Learn Factor Mean Scores by Group at Earlier Grades vs. Later Grades 18
10. Ready to Learn Factor Mean Scores by Group for Participants With Data Only at Kindergarten/Grade 1 18
11. Held-Back Rate by Group and Grade 20
12. Grade 4: Academic Performance by Group 22
13. Grade 4: Academic Performance by Group (with estimated scores included) 23
14. Special Services Received by Group 25
15. K–2: Parent Involvement and Expectations by Group 26
16. Correlations Between Parent Involvement and Child School Readiness Outcomes 28

A1. K-2: Results of Analysis of Within-Subject Effects for Parent Involvement and Expectations Using Subscale *Z* Scores Across Three Years 33
A2. Number of Participants in the Original and Derived Parent Data Sets, by Group and Site 34
A3. Reported Versus Estimated Family Income at Kindergarten 35
A4. Correlations of Reported and Estimated Income With SRRS Total Scores 35
A5. Analysis of Within-Subject Effects for the SRRS School Readiness Factor Scores Across Years 36
A6. Correlations Between MEAP Scores and Teachers' Ratings on the SRRS 36
A7. Cohort 1 Grade 4: Sample Status by Study Site 37

Figures

A. MSRP Participants Versus Nonparticipants: Academic Performance at Grade 4 ii
B. Kindergarten Child Observation Ratings ii
1. Geographic Location of the Six Study Sites 3
2. Risk Factors for MSRP Sample Versus Statewide 6
3. Percentage of Programs of High, Medium, and Low Quality 12
4. Child Observation Record Scores by Group 13
5. Newly Occurring Held-Back Rate at Each Grade by Group 20
6. Cumulative Held-Back Rate by Group and Grade 21
7. Mathematics Performance at Grade 4 by Group 23
8. Reading Performance at Grade 4 by Group 24
9. K–2: Parent Frequent Involvement by Group 27

EXECUTIVE SUMMARY

Children who participated in the Michigan School Readiness Program (MSRP), Michigan's preschool program for 4-year-olds who are at risk for school failure, are better prepared when they enter school and continue to do better academically 5 years later. This preschool program, which began in 1985, serves 26,000 children a year in 456 school districts and 65 community agencies. Children qualify for the program by having 2 of 25 risk factors, for example, living in a low-income family and living in a single-parent family. Each class has a certified teacher and a trained assistant teacher to serve no more than 16 children. Observers have given the classes high quality ratings, averaging 4.4 on a 5-point scale.

Compared to their classmates of similar age and socioeconomic background who did not attend the program, 24% more MSRP participants passed the Michigan Educational Assessment Program (MEAP) literacy test for grade four and 16% more passed the mathematics test. In addition, 35% fewer participants needed to repeat a grade, as shown in Figure A. Based on these numbers, this program annually prevents an estimated 1,700 Michigan children from having to repeat a grade, saving the state an estimated $11 million each year by this effect alone.

For the evaluation, 338 children who had participated in the state-funded preschool program and 258 comparison children of similar age and socioeconomic status who did not participate were followed from their entrance into kindergarten in 1996 through fourth grade. The evaluation sites were in and around Detroit, Grand Rapids, Grayling, Kalamazoo, Muskegon, and Port Huron. From kindergarten through fourth grade, children who had attended the preschool program were found by their elementary teachers to be significantly more ready to learn than their nonparticipating classmates were—more interested in school; more likely to have good attendance, take initiative, and retain learning; stronger in reading, mathematics, thinking, and problem-solving skills; and better at working with others.

Compared to their nonparticipating classmates at the beginning of kindergarten, children who had completed the preschool program were found by observers to be significantly more advanced in key areas of development—language and literacy, creative representation, music and movement, initiative, and social relations, as shown in Figure B. Their parents were also more involved in their children's school activities and talked with their teachers more frequently.

Figure A
MSRP Participants Versus Nonparticipants Academic Performance At Grade 4

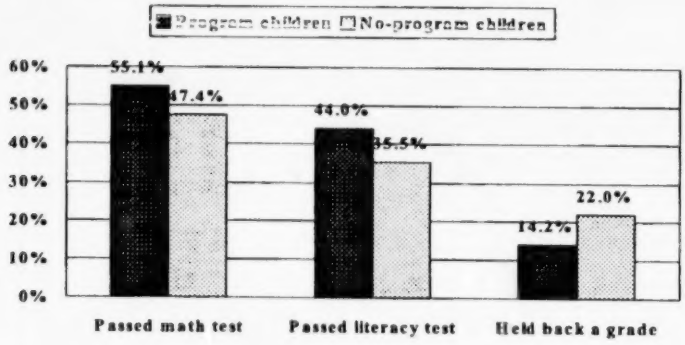
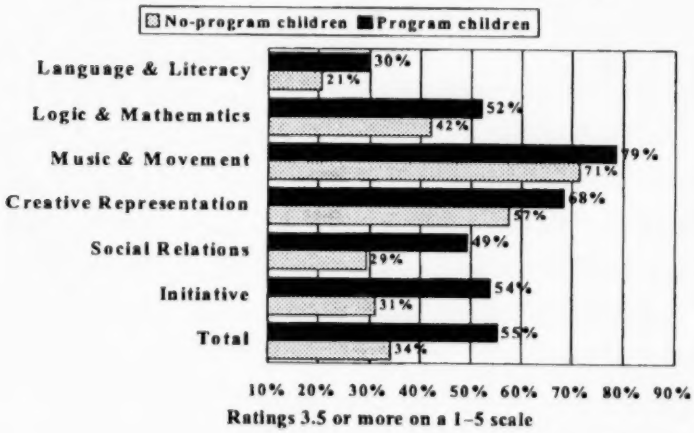


Figure B
Kindergarten Child Observation Ratings



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Review of the Study and Its Design

The longitudinal evaluation of the Michigan School Readiness Program started in 1996 and its fifth-year study is now completed. Launched by the Michigan State Board of Education and conducted by the High/Scope Educational Research Foundation, the study is evaluating the effectiveness of the program. Findings from kindergarten through grade 3 were reported earlier.[1] This report presents all the major findings of the 5 years systematically so that the results of the study can be viewed in a complete and longitudinal perspective. The findings for the fourth-grade follow-up are reported for the first time, including the Michigan Educational Assessment Program (MEAP) results for the study participants. In addition, grade repetition rates for the previous grades are updated because of additional data available, and results of an in-depth analysis on school readiness data across the 5 years are also reported. A brief review of the study and its design is presented first.

The Michigan School Readiness Program

The Michigan School Readiness Program (MSRP) is one of 31 state-initiated and state-funded preschool programs in the U.S. (Ripple, Gilliam, Chanana, & Zigler, 1999). The program is designed to help poor children and/or other children at risk for school failure to start school ready to learn. Children who are enrolled in the MSRP have at least 2 of the 25 risk factors defined by the state, such as living in a single-parent family, living in a low-income family, having had low birth weight, and having been abused or neglected. The MSRP provides 9 months of educational experiences to these children beginning at age 4. Its curriculum is designed to promote children's intellectual and social growth through developmentally appropriate activities. The program also encourages family participation and provides parenting support, guidance, and referrals to community services as needed.

The MSRP started small in 1985 and has grown tremendously in the past few years. A variety of regulations were established to maintain the quality of the service, including the requirements of a 4-year bachelor's degree for lead teachers, a 2-year associate degree for assistant teachers, and an adult-child ratio of 1 to 8 or better. Now operating in 488 school districts and 67 agencies, the MSRP is providing both part- and full-day programs for over 20,000 Michigan children each year.

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[1]Florian, Schweinhart, and Epstein (1997); Xiang, Schweinhart et al. (2000), Xiang and Schweinhart (2001).

The MSRP Evaluation's State Longitudinal Study

The evaluation effort started with the 1995–1996 class, in which program quality was first assessed at six sites around the state. Since then, a series of MSRP evaluation studies have been conducted, including both sampled studies and statewide self-evaluations for part-day as well as full-day programs. This report presents the first longitudinal study of the MSRP, evaluating the MSRP part-day programs in terms of their effectiveness on child school readiness and performance from kindergarten through grade 4.

Research Questions

Two research questions flow from two major intended effects of the MSRP:

- Does the program contribute to children's development and readiness for school participation?
- Does the program help parents contribute to children's development and readiness for school participation?

Study Participants

To answer the research questions, the study is designed to provide a fair comparison between two groups of children, one that attended the MSRP and the other that was similar to the MSRP group in age and socioeconomic background, but did not attend the MSRP or other preschool programs. This design is not as effective as random assignment would be in controlling for parents' motivation to be involved in the program. However, it provides a base for fair comparison because of similar socioeconomic conditions between the two study groups.

The study began with the 1995–1996 MSRP class. For a brief time, the study also included the 1996–1997 MSRP class, but due to a large amount of missing data for this class, we decided to focus only on the 1995–1996 class. As a result, what is presented in this report, including research methodology and findings, is based only on data from the 1995–1996 class.

Study sites. Figure 1 shows that the study participants were at six sites throughout the state: Detroit Public Schools in the southeast, the Economic Opportunity Committee of St. Clair County in Port Huron in the east, COOR Intermediate School District in the north, Muskegon Public Schools in the west, and Wyoming/Godwin Heights/Godfrey Lee/Kelloggsville School District consortium and Kalamazoo Public Schools in the southwest.

Figure 1: Geographic Location of the Six Study Sites

Identification of study participants. All the study participants were first identified as they entered kindergarten in 1996. Children were identified for the no-program comparison group based on three criteria:

- They entered kindergarten in 1996, the same year as the MSRP children.
- They did not have a preschool program experience, although a small percentage had received child care in either child care centers (4%) or caregivers' homes (18%).
- They came from families whose income was low enough to have qualified them for the MSRP, based on parents' self-reported income on the Child and Family Background Questionnaire.

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Table 1 presents the number of participants by group and site. The number of participants from each site is around 100 (89 to112). There are more MSRP participants than no-program children (57% vs. 43%), but no significant effects of site by group were detected by chi-square tests.

Table 1. Number of Study Participants by Study Group and Site

Site	MSRP Group	No-Program Group	Total Sample
COOR Intermediate School District	45	44	89
Detroit Public Schools	52	53	105
Economic Opportunity Committee	63	46	109
Kalamazoo Public Schools	53	38	91
Muskegon Public Schools	75	37	112
Wyoming/Godwin/Godfrey/Kelloggsville Public Schools	50	40	90
Total	**338 (57%)**	**258 (43%)**	**596 (100%)**

Note. $\chi^2 = 8.57$, $df = 5$, $p > .05$. 623 children were originally identified at kindergarten entry, but 27 had no outcome data by the end of the year, so 596 was finalized as the study sample.

Characteristics of study participants. To achieve a fair comparison, analyses were conducted to examine whether the two study groups were equal in age, gender, and family socioeconomic status. Table 2 presents the results, which indicate that there was no significant difference between the two groups in any of the key variables except for father's education. On average, the MSRP children's fathers had more years of education than the no-program children's fathers. But it is to be noted that the percentage of missing data for father's education (29%) was higher than the other variables (1% to 20%).

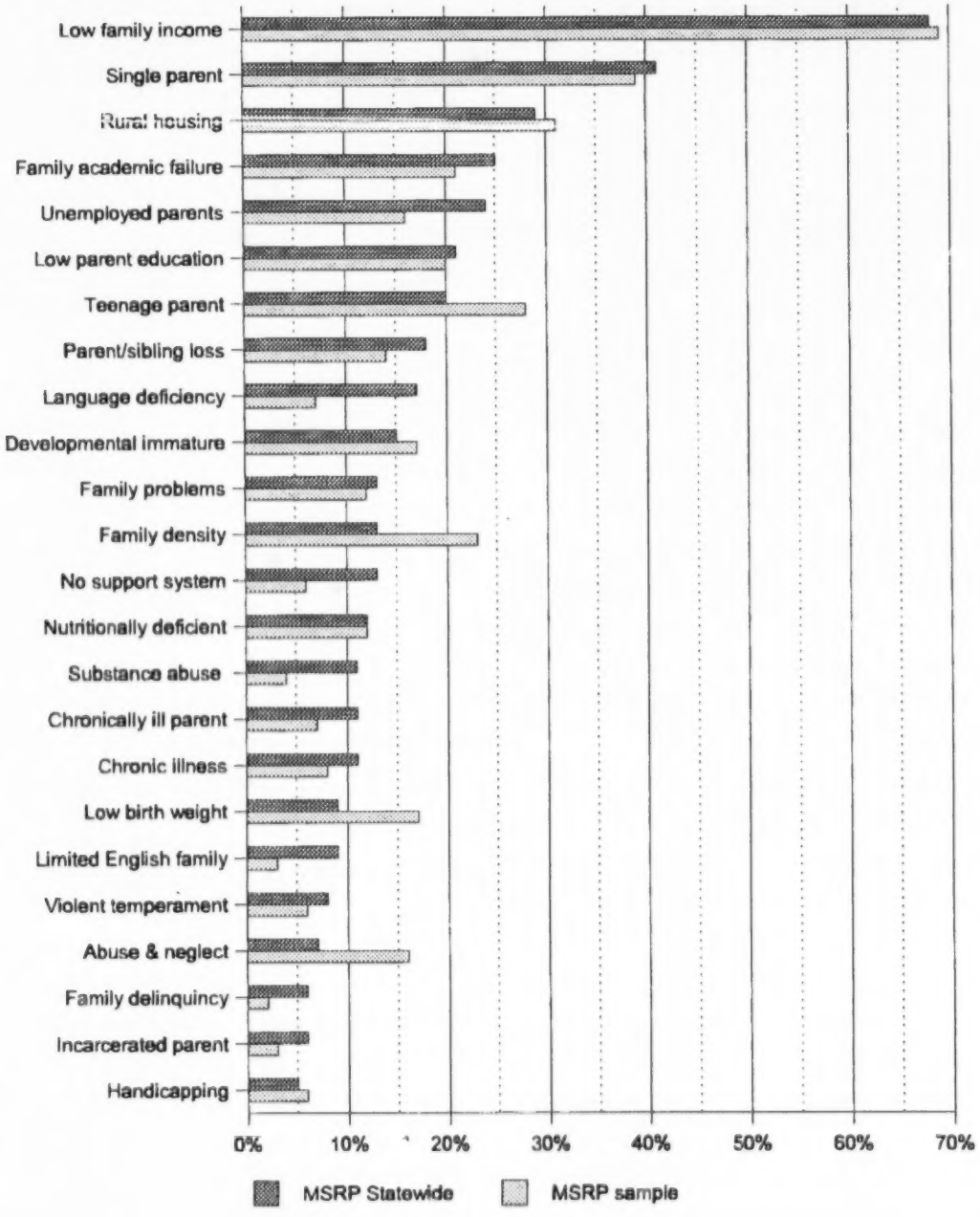
Table 2. Child Characteristics and Socioeconomic Status by Study Group

Variable	Group	*n*	Average/ Percentage	Statistical Significance
Average age at entry of kindergarten	MSRP	336	5.30	—
	No-program	253	5.29	
Gender composition (Male : Female)	MSRP	333	48.6% : 51.4%	—
	No-program	255	49.0% : 51.0%	
Father in home	MSRP	291	61.5%	—
	No-program	231	60.6%	
Number of people per household	MSRP	292	4.53	—
	No-program	231	4.69	
Mother's highest year of education	MSRP	288	12.14	—
	No-program	226	11.95	
Father's highest year of education	MSRP	239	12.11	$p < .05$
	No-program	183	11.70	
Household annual income	MSRP	277	$17,882	—
	No-program	206	$18,022	

Note. "–" = not significant. The sample sizes for the variables varied from 82%–99% for the MSRP group (n = 338), and 80% to 99% for the no-program group (n = 258), except for fathers' education, for which both groups had only 71% cases present.

Another set of characteristics examined was risk factors. As shown in Figure 2, the pattern of risk factors for the MSRP study participants was very similar to that for MSRP children statewide. The variations between the two patterns are sufficiently small and few among 24 factors (a 25th factor—"other"—was not included in the count) to indicate that the MSRP sample was representative of the statewide MSRP population.

Figure 2. Risk Factors for MSRP Sample versus Statewide



To summarize the MSRP study group, two conclusions can be made. First, it was representative of the statewide MSRP population. Second, it was similar to the no-program comparison group on key background variables, including age, gender, and family socioeconomic conditions. The two study groups might have been more similar if a random sample had been available or a pretest of child developmental level conducted. Nevertheless, the characteristics of the achieved sample presented above provided a solid base for a fair comparison of the two study groups.

Measures and Data Collection

The following data were collected to answer the research questions identified at the beginning of this project.

Child Outcomes:

- The High/Scope Child Observation Record (COR) measures child development in six areas: *initiative*, *social relations*, *creative representation*, *music and movement*, *language and literacy*, and *logic and mathematics*. The data were collected early in kindergarten by trained outside observers. COR ratings by teachers had alpha reliability coefficients of .66 to .93 and interobserver reliability of .57 to .76. The validity of teachers' COR ratings is .37 to .53 with McCarthy Scales of Children's Abilities and .51 to .61 with child age (High/Scope Educational Research Foundation, 1992) .

- The School Readiness Rating Scale (SRRS) measures children's development of readiness to learn. The ratings were completed by the teachers of the participating children every year from kindergarten through grade 4. Eleven items were rated in kindergarten. A few more items have been added to assess the expanding learning and developmental domains as children progress to the higher grades. The alpha reliability coefficients of the SRRS were found to be .90 to .95 over the 5 years in this study. The Pearson product-moment correlation coefficients between the SRRS total score and the Michigan Educational Assessment Program (MEAP) scores at grade 4 were .45 (literacy) and .53 (mathematics).

- School Records Review provides information about the special services the children used, grade repetition, and school attendance. The data were collected each year through grade 4, usually by school district staff.

- The Michigan Educational Assessment Program (MEAP) is a statewide test assessing student academic performance. The MEAP test administered in the 2000–2001 school year provided the information on study participants' performance in reading and mathematics at grade 4.

Parent Outcomes:

- The Parent Interview provides information about parent involvement in child-related activities both in school and at home, as well as parents' expectations for their child's schooling. The interview was conducted by High/Scope staff each year from kindergarten through grade 2, usually over the phone.

Participants' Family Background:

- The Child and Family Background Questionnaire provides child socioeconomic information and preschool program participation information collected from parents at kindergarten. Some of the data missing from the initial data collection were collected at grade 2.

Program Quality:

- The High/Scope Program Quality Assessment assesses MSRP classrooms in nine areas: *philosophy*, *population access*, *curriculum*, *learning environment*, *advisory council*, *parent involvement*, *funding*, *administration and supervision*, and *instructional staff*. The assessment was conducted by trained outside data collectors when the participating MSRP children were in the 1995–1996 MSRP program. In this study, the alpha reliability coefficient was .95, and the inter-rater reliability, defined as the percentage of agreement between the trainer and trainees were 80% to 96%. The correlation coefficient between the PQA and the ECERS was .86 in previous studies (High/Scope Educational Research Foundation, 1998).

Data Analysis

The major purpose of the data analysis was to examine whether the MSRP group had better outcomes (e.g., child school readiness, parent involvement) than the no-program group, provided the two groups were equal in background status. All the other analyses were conducted to help achieve this purpose.

Tests for MSRP effects. As reported above, the analysis of child characteristics and family socioeconomic status indicated no major differences between the two groups (see Table 2). Therefore, a direct comparison of the two groups' outcomes should be a fair and valid approach to testing for MSRP effects. However, we decided to conduct another set of adjusted analyses for a more rigorous test for MSRP effects, i.e., to control for the participants' key background variables while comparing the two groups' outcomes. There are two reasons for conducting the adjusted analyses: (1) The study participants were not randomly assigned to study groups and some bias may exist, and (2) there might be bias in data collection and attrition for other reasons.

Table 3 lists the key background variables we selected to control as covariates in the adjusted analyses for MSRP effects.

Table 3. Key Background Variables Selected in Adjusted Analyses for MSRP Effects

Family Socioeconomic Status	Child's Own Characteristics	Other
Father at home or not	Age (in months)	Study site
Number of people in the household	Gender	
Mother's highest year of education		
Household annual income		

These family and child variables were chosen because numerous research studies have shown them to be strong predictors of child development and school adjustment. *Study site* was included because of its influence on school readiness outcomes (e.g., local policies on grade retention and educational practice), due to variations in sites' socioeconomic situation and program administration. Unfortunately, three variables could not be included in the adjusted analyses:

- Father's education, which was found to be significantly different between the two study groups. Its large amount of missing data would have greatly reduced the sample size and limited the representativeness of the sample. Nevertheless, we did examine its influence on outcome variables in the preliminary analyses and found no significant contribution from it in general.
- Child ethnicity, which was not collected until recently and had too much missing data.
- Risk factors, on which data were practically impossible to collect from no-program children.

Two statistical approaches were employed to conduct the adjusted analyses for program effects: *analysis of covariance*, which is essentially analysis of variance within a regression model, was used for analyzing continuous dependent variables such as the COR and SRRS scores. For the binary dependent variables such as held-back rate, we used *logistic regression analysis*. Both of these statistical approaches helped to isolate the apparent MSRP effects, while estimating the apparent effects of other key variables at the same time. The results of the analyses can show whether or not the MSRP participants achieved better outcomes after controlling for the potential influence of their status on key background variables.

Since the adjusted analyses for program effects required complete data, the participants with data missing on even one background variable were excluded from the adjusted analysis. The sample sizes for the adjusted analyses were 10% to 25% smaller than those for the unadjusted analyses, depending on the outcome variables. For example, 95% of the data were available for the fourth grade held-back rate analysis, but only 74% could be included in the adjusted analyses. Because this kind of exclusion may also cause bias (e.g., fewer very disadvantaged families might report their background status, so that the adjusted analyses included only the better-off children), we present the results for both adjusted and unadjusted analyses, with the descriptive statistics from all the available data without background adjustment, and the results of adjusted analysis as another type of evidence for program effects. When the results of both analyses agree, we have stronger confidence in the findings.

Other data analyses. Other data analyses dealt with missing data and data reduction. The appendix provides the detailed procedures and results for the analyses intended to minimize missing data on grade repetition, socioeconomic status, and parent involvement. These procedures helped to include 15% to 25% more data in the analyses for program effects. For data reduction, factor analysis was conducted on the SRRS item scores across years (see pages 14–18). This analysis helped to address our research questions more effectively.

Major Findings

In this part of the report, we answer the research questions about MSRP effects on children's school readiness. Five indicators of children's school readiness were examined:

- Developmental level at kindergarten, represented by the COR scores
- School readiness, represented by the teacher-rated SRRS scores from kindergarten through grade 4
- Held-back rates from grade 1 through grade 4
- Academic performance, indicated by the MEAP results at grade 4
- Special services received in the 5 years

Findings related to the MSRP effects on parents include (1) parent involvement in child education and expectations for their child's schooling and (2) the relationship between parent participation and children's school readiness.

For a better understanding of the findings about program effects, we first present the results of the MSRP program quality assessed in the program year (1995–1996) preceding the entry of these children into kindergaarten.

MSRP Program Quality

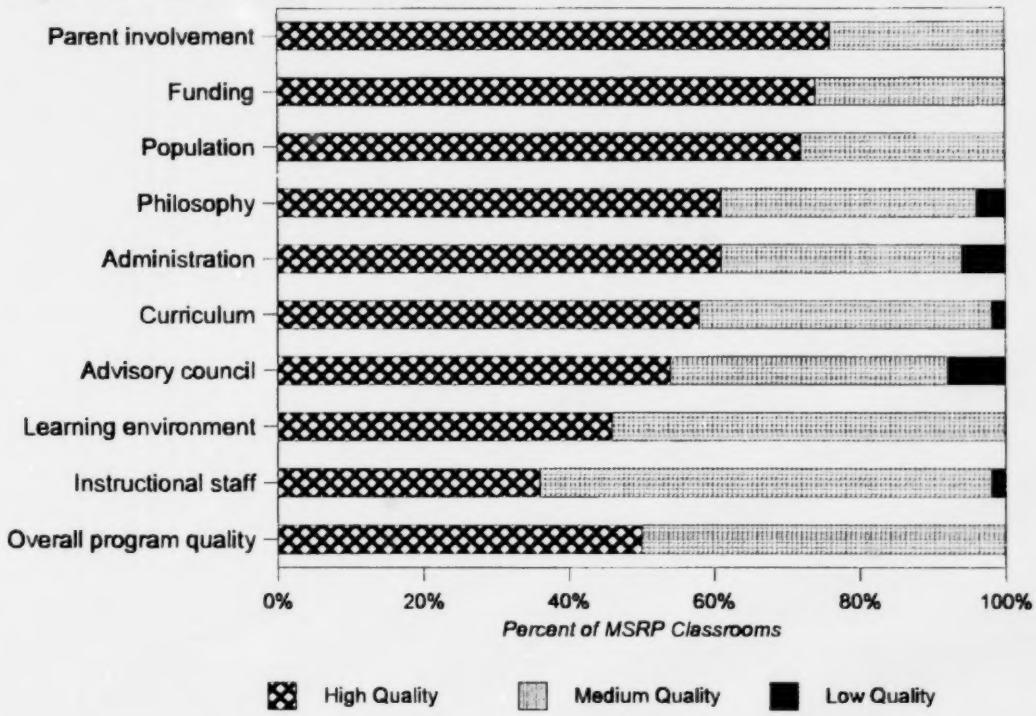
The quality of the 49 classrooms of MSRP study participants was assessed by trained outside observers with the Program Quality Assessment. As shown in Table 4, both subscores and total scores were quite high on a scale from 1 to 5. Figure 3 presents the percentage of programs with high (average ratings of 4.50 to 5.00), medium (3.00 to 4.49), and low (1.00 to 2.99) quality for each program area and overall. Although there were low scores for a few programs in some areas, no programs were found to have low mean scores on overall program quality, and 49% achieved high-level mean scores for overall quality.

Table 4. Aspects of MSRP Program Quality for the Sample Classrooms in 1995-1996

Program Area	Mean	Standard Deviation
Population access	4.54	.54
Parent involvement	4.53	.48
Funding	4.48	.70
Curriculum	4.40	.55
Learning environment	4.40	.50
Philosophy	4.39	08
Instructional staff	4.34	.37
Administration & supervision	4.25	.89
Advisory council	4.21	.83
PQA total	4.39	.42

Note. *N* = 49 classrooms. PQA items are scored on a scale form 1 (low) to 5 (high)

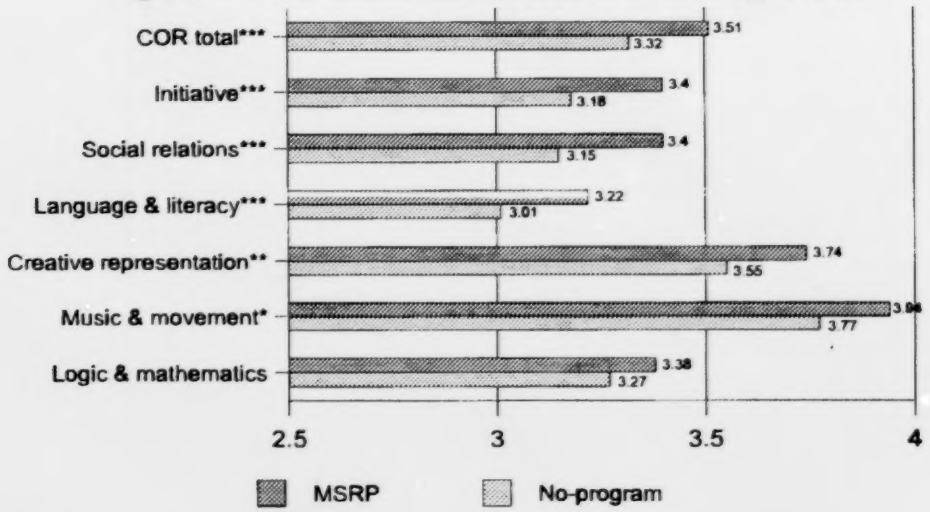
Figure 3. Percentage of Programs of High, Medium and Low Quality



MSRP and Children's Developmental Level at Kindergarten

Compared to the students who had not participated in the MSRP, the students who had participated in the program scored significantly higher in overall development at kindergarten. Both analyses, with and without background adjustment, showed that the MSRP group scored significantly higher on the COR total, and 5 of the 6 subscales: *language and literacy, initiative, social relations, creative representation,* and *music and movement* (but not *logic and mathematics*), as shown in Figure 4 and Table 5. Note that unadjusted and adjusted findings have exactly the same levels of statistical significance.

Figure 4. Child Observation Record Scores by Group



Note. Ratings are scored on a scale from 1 (low) to 5 (high). *** = $p < .001$; ** = $p < .01$; * = $p < .05$. There are minor changes in the current results of significance tests because of additional background data available since the last reported findings (Xiang, Schweinhart et al., 2000).

Table 5. COR Scores by Group and Results of Testing for Group Difference

COR Item	Mean (*SD*)		Significance of Group Differences	
	MSRP ($n = 263$)	No-program ($n = 200$)	Background Unadjusted ($n = 463$)	Background Adjusted ($n = 400$)
Initiative	3.40 (.65)	3.18 (.65)	$p < .001$	$p < .001$
Social relations	3.40 (.71)	3.15 (.65)	$p < .001$	$p < .001$
Creative representation	3.74 (.73)	3.55 (.69)	$p < .01$	$p < .01$
Music & movement	3.94 (.70)	3.77 (.74)	$p < .05$	$p < .05$
Language & literacy	3.22 (.60)	3.01 (.53)	$p < .001$	$p < .001$
Logic & mathematics	3.38 (.74)	3.27 (.69)	$p = .10$	$p = .14$
COR total	**3.51 (.52)**	**3.32 (.45)**	***p* < .001**	***p* < .001**

Note. 463 is 78% of the study sample, and 400 is 67%.

MSRP and Children's School Readiness Status From Kindergarten Through Grade 4

Compared to the children who had not participated in the MSRP, teachers rated the children who had participated in the program significantly higher in school readiness from kindergarten through grade 4. From kindergarten through grade 3, the MSRP group was found to have achieved significantly higher ratings from teachers than the no-program group in some items of the School Readiness Rating Scale (SRRS): *retains learning*, *ready to learn and participate*, *shows initiative*, *good attendance*, and *shows interest in school work*. Other items such as *literacy skills*, *thinking skills*, and *makes good progress to next grade* showed non-significant differences in favor of the MSRP at grade 3 (Xiang & Schweinhart, 2001). These emerging trends were found to be further supported by grade 4 findings: the MSRP children were rated significantly higher by their teachers in *mathematics*, *literacy*, *thinking skills*, and *problem solving* as shown in Table 6. In order to have a better understanding of the changes over the years, factor analysis was conducted to explore the structure of the SRRS items. Table 7 presents the results, which indicates a clear pattern of the school readiness structure across years, despite the fact that teachers at each grade were independent of each other.

The first component (F1) can explain most of the items: *shows initiative, interest in school work, completes assignments, problem solving, imaginative, ready to learn*, and *mathematics, literacy* and *thinking skills*. The second component (F2) has only a few items with high loadings: *cooperative, gets along well with teachers* and *gets along well with other children*. Correlations between the SRRS factor scores and other child school readiness outcomes indicate that the first factor score has a strong association with students' MEAP scores: .61 with overall mathematics and .51 with overall reading performance ($n = 336$, $p < .001$), and an expected negative correlation with being held back a grade ($r = -.23$, $n = 438$, $p < .001$), while the second factor has no association with any of them. In view of the item composition of these two factors and their relationship with other school readiness outcomes, the first factor is named the *ready to learn* factor, and the second, *social relations*.

Table 6. Grade 4: Teacher Ratings on School Readiness Rating Scale

SRRS Items	Percentage of Teachers Who Agreed/Strongly Agreed: MSRP Group	Percentage of Teachers Who Agreed/Strongly Agreed: No-program Group	Statistical Significance[1]
Takes initiative	63.4%	62.7%	–
Has a good attendance record	86.8%	79.4%	$p = .07$
Shows interest in school work	74.9%	70.2%	–
Gets along with other children	81.2%	82.6%	–
Gets along with teachers	89.2%	89.8%	–
Takes responsibility for own errors	66.8%	65.7%	–
Retains what he/she learns	69.2%	62.2%	–
Is cooperative	84.9%	83.7%	–
Completes assignments	68.6%	66.3%	–
Is imaginative and creative	74.6%	65.9%	$p = .09$
Is ready to learn & participate	75.7%	71.4%	–
Tries out several approaches	56.0%	43.8%	**$p < .05$**
Grade-level collaborative skills	70.8%	63.1%	–
Grade-level literacy skills	67.3%	56.7%	**$p < .05$**
Grade-level mathematics skills	69.4%	58.9%	**$p < .05$**
Development socially and emotionally	68.5%	73.0%	–
Grade-level thinking skills	64.4%	51.7%	**$p < .05$**
Development of physical abilities	93.4%	93.7%	–
Makes good progress to next grade	72.1%	62.7%	$p = .08$
Total score (average)	2.96 (out of 4)	2.86 (out of 4)	–

Note. "–" = not significant. The sample sizes varied from 257 to 260 out of 338 (76–77%) for the MSRP group, and 174–178 out of 258 (67–69%) for the no-program group.

[1]Statistical significance testing was conducted with logistic regression analysis controlling for group differences in children's background characteristics.

Because the two factors are clear in concept and well represent most of the SRRS items, analyses were conducted to examine how the two study groups performed on these two factors. As shown in Table 8, the MSRP group had significantly higher scores on the *ready to learn* factor than their counterparts, from kindergarten through grade 4. This result was further supported by the analysis with adjustment of key background variables. No significant differences were found between the two groups for the *social relations* scores.

Table 7. Factor Loadings of SRRS Items on Factor 1 (F1) and 2 (F2) Across Grades

SRRS Items	Kindergarten		Grade 1		Grade 3		Grade 4	
	F1	F2	F1	F2	F1	F2	F1	F2
Shows initiative	.84		.77		.72		.65	
Retains learning	.84		.85		.86		.88	
Imaginative and creative	.80		.79		.70		.66	
Interest in school work	.80		.74		.63	.58	.61	.59
Ready to learn	.76		.75		.63	.58	.65	.56
Completes assignments	.76		.71		.62	.51	.52	.59
Responsible for own errors	.69			.66		.77		.78
Gets along with other children		.86		.86		.85		.85
Gets along with teachers		.85		.86		.89		.88
Cooperative		.84		.84		.86		.86
Good attendance			.51					
Problem solving		–	.82		.78		.77	
Grade-level literacy skills		–	.83		.84		.86	
Grade-level mathematics skills		–	.80		.84		.88	
Grade-level thinking skills		–		–	.85		.88	
Grade-level collaborative skills		–		–	.80		.79	
Social/emotional development		–		–		.64		.71
Physical ability		–		–				
Good progress to next grade		–		–	.85		.85	
Total variance explained	**42%**	**25%**	**44%**	**24%**	**41%**	**27%**	**40%**	**28%**

Note. Grade 2's data were not included due to the use of different scales for the held-back and non-held-back students in that year. Extraction method = principal component analysis, rotation method = varimax. Empty cell = factor loading less than .50. "–" = Not applicable. N = 498 (84% of study sample) for kindergarten; 444 (74%) for grade 1; 420 (70%) for grade 3; and 438 (73%) for grade 4.

Table 8. Factor Scores of the School Readiness Rating Scale by Group and Grade

		Mean (*SD*)		Significance for Group Difference	
Factor	**Grade**	**MSRP**	**No-Program**	**Background Unadjusted**	**Background Adjusted**
Ready to learn	K	.11 (.97)	- .16 (1.02)	$p < .01$ ($n = 498$)	$p < .05$ ($n = 390$)
	1	.10 (.97)	-.13 (1.02)	$p < .05$ ($n = 444$)	$p < .05$ ($n = 369$)
	3	.07 (1.00)	- .10 (.99)	$p = .08$ ($n = 420$)	$p < .05$ ($n = 341$)
	4	.11 (.98)	- .16 (1.01)	$p < .01$ ($n = 438$)	$p < .05$ ($n = 345$)
Social relations	K	- .05 (1.02)	.08 (.96)	– ($n = 498$)	– ($n = 390$)
	1	- .05 (1.03)	.07 (.95)	– ($n = 444$)	– ($n = 369$)
	3	.02 (1.00)	- .03 (1.01)	– ($n = 420$)	– ($n = 341$)
	4	- .04 (1.02)	.05 (.96)	– ($n = 438$)	– ($n = 345$)

Note. Grade 2's data were not included due to the different scales used for the held-back students in that year. "–" = not significant. For unadjusted analysis, 498, 444, 420, 438 are 84%, 74%, 70%, and 73% of the study sample; for adjusted analysis, 390, 369, 341, 345 are 65%, 62%, 57%, and 58% of the study sample.

Looking at the ready to learn scores longitudinally, the difference between the unadjusted means of the two groups has remained at about the same level across the years (.27 at kindergarten, .23 at grade 1, .17 at grade 3, and .27 at grade 4). However, due to incomplete data across the years for about half the participants, these results provide only weak support for this conclusion. In order to further examine whether the MSRP effects on children's readiness to learn were fading or not, combined scores of kindergarten and grade 1 were compared to the combined scores for grades 3 and 4 (for the justification of these combined scores, see results of within-subject-effect analysis in Appendix Table A5). The advantage of using combined scores is the increase in completeness of data for both time points, with a coverage of 78% of the study sample. Table 9 presents the results of this analysis. The mean difference between the two groups at grade 3/grade 4 was found to be the *same* as in kindergarten/grade 1 (.22 vs. .21).

Table 9. Ready to Learn Factor Mean Scores by Group at Earlier Grades vs. Later Grades

Group	*n*	Mean (*SD*)	
		Kindergarten/Grade 1	Grade 3/Grade 4
MSRP	277	.06 (.98)	.10 (.99)
No-Program	190	- .15 (.99)	- .12 (.98)
Mean difference		.21	.22

Note. 467 (277 for MSRP group, 190 for no-program group) is 78% of the study sample.

To further test whether any bias was caused by attrition, we examined the 109 participants who were not included in the analysis because of missing data at later grades. As shown in Table 10, the participants with only kindergarten data available had a lower mean score than those with complete data. But the extent of the mean difference between the MSRP and no-program groups for these participants was even larger than the group difference found with complete data. Based on the evidence of stability of the SRRS mean score across years within individual participants (see Appendix Table A5), this finding implies that the group difference of *ready to learn* scores would have been larger in the later grades, if the missing participants' data had been available.

Table 10. Ready to Learn Factor Mean Scores by Group for Participants With Data Only at Kindergarten/Grade 1

Group	*n*	Mean (*SD*) Kindergarten/Grade 1
MSRP	64	.03 (.96)
No-program	45	- .25 (1.09)

Note. 109 (64 for MSRP group, 45 for no-program group) is 19% of the study sample.

In sum, results of these analyses, which took into account 97% of the study sample (78% with complete data and 19% with incomplete data) suggest that *the extent of difference between the MSRP and no-program groups in child readiness to learn rated by teachers had not become smaller by the end of grade 4.*

MSRP and Held-Back Rates From Grade 1 Through Grade 4

Students who had participated in the MSRP were held back a grade at a significantly lower rate from grade 2 through grade 4 than the children who had not participated in the program. By held back, we mean any form of repeating a school year. Table 11 presents numbers of children by grade status each year from grade 1 through grade 4 (none of the study participants were held back in the kindergarten year). These numbers indicate two important facts, summarized in Figures 5 and 6.

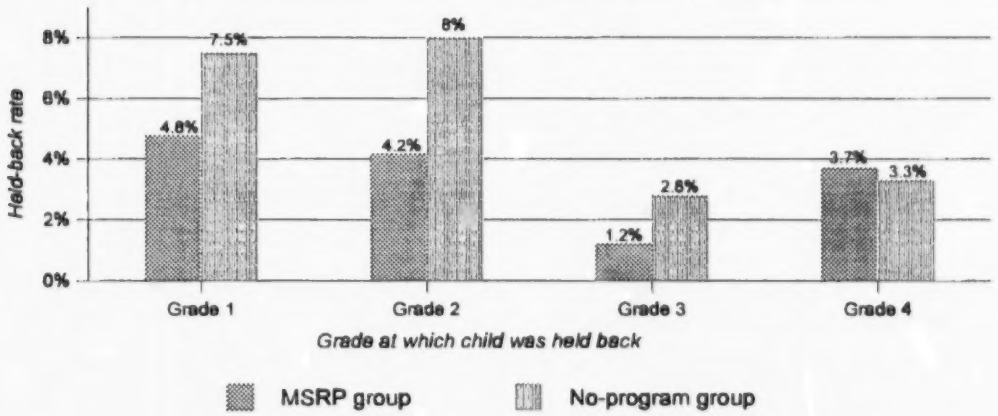
- Fewer MSRP participants than comparison children were held back at grades 1, 2, and 3. The corresponding held-back rates at grade 4 were about the same for both groups, as shown in Figure 5.
- Compared to the no-program group, the MSRP participants had significantly lower cumulative held-back rates from grade 2 through grade 4, by 42%, 44%, and 35%, respectively (see Figure 6). The statistical significance of the group difference in held-back rates was supported by analyses both with and without key background variables controlled.

Table 11. Held-Back Rate by Group and Grade

Grade	Group	Held back		On Grade	Home Schooled	Total
		New	Cumulative			
1	MSRP	16 (4.8%)	16 (4.8%)	316 (94.9%)	1 (0.3%)	333
	No-program	19 (7.5%)	19 (7.5%)	232 (92.1%)	1 (0.4%)	252
2	MSRP	14 (4.2%)	30 (9.1%)	299 (90.6%)	1 (0.3%)	330
	No-program	20 (8.0%)	39 (15.6%)	210 (84.0%)	1 (0.4%)	250
3	MSRP	4 (1.2%)	34 (10.5%)	287 (88.9%)	2 (0.6%)	323
	No-program	7 (2.8%)	46 (18.6%)	200 (81.0%)	1 (0.4%)	247
4	MSRP	12 (3.7%)	46 (14.2%)	275 (85.2%)	2 (0.6%)	323
	No-program	8 (3.3%)	54 (22.0%)	187 (76.3%)	4 (1.7%)	245

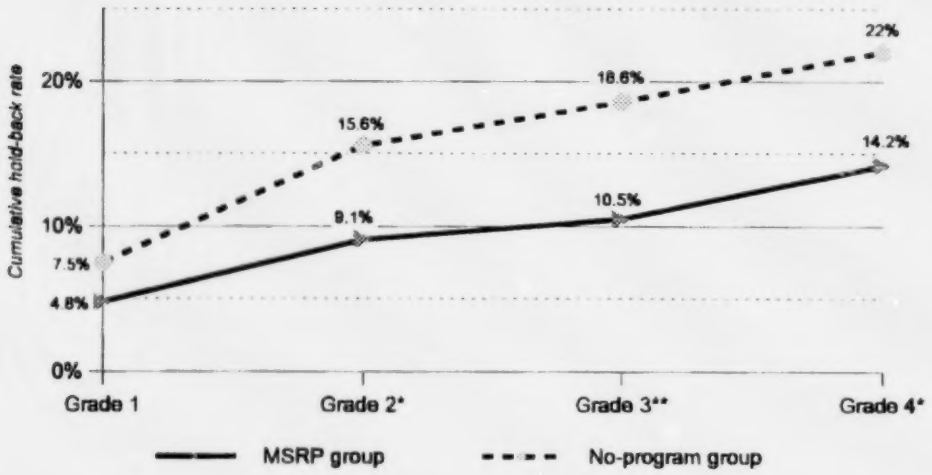
Note. n = 585 (98% of study sample) for grade 1; 580 (97%) for grade 2; 570 (96%) for grade 3; and 568 (95%) for grade 4.

Figure 5. Newly Occurring Held-Back Rate at Each Grade by Group



Note. Grade 1: n = 585 (98%), grade 2: n = 580 (97%), grade 3: n = 570 (96%), grade 4: n = 568 (95%). Results for group differences were based on background adjusted analyses (grade 1: n = 461(77%), grade 2: n = 457 (77%), grade 3: n = 446 (75%), grade 4: n = 443 (74%).

Figure 6. Cumulative Held-Back Rate by Group and Grade



*= p<.05, **= p < .01

MSRP and Children's Academic Performance at Grade 4

The students who had attended the MSRP had a higher percentage of satisfactory scores on the MEAP tests for both reading and mathematics. MEAP tests were employed in the study to evaluate program effects on child academic performance. However, only data for the *non-held-back* study participants were available by grade 4, while those for the held-back participants were not, because they were not yet in grade 4 when the MEAP was given. Nevertheless, held-back status is an academic indicator by itself, because the held-back decision is usually based on the student's level of academic performance. An analysis of academic performance without considering the influence of held-back status would be biased for its exclusion of low academic achievers (Barnett, 1993, in press). Therefore, we decided to include the held-back participants in the evaluation of the program effects on child academic performance. Table 12 present the results of this evaluation: the program participants had a higher rate of satisfactory scores on the MEAP tests for both reading and mathematics and a lower rate for the held-back level, compared to the no-program children.

Table 12. Grade 4: Academic Performance by Group

		Level of Academic Performance			
Subject	Group	Satisfactory on MEAP	Not Satisfactory on MEAP	Held Back	Total
Mathematics	MSRP	169 (54.9%)	93 (30.2%)	46 (14.9%)	308
	No-program	107 (47.3%)	65 (28.8%)	54 (23.9%)	226
Literacy	MSRP	134 (43.4%)	129 (41.7%)	46 (14.9%)	309
	No-program	78 (34.5%)	94 (41.6%)	54 (23.9%)	226

Note. $n = 534$ for mathematics and 535 for literacy, 90% of the study sample.

Since 34 fourth graders were not included in the analysis because of unavailability of their MEAP scores, the held-back rates here differ from the corresponding rate presented in Table 11, with a small favoring effect for the MSRP group. An adjustment was therefore made so that program effects on child academic performance could be tested more rigorously. Because high correlations were found between teachers' ratings on mathematics and literacy skills and the MEAP scores for the two corresponding subjects (See Appendix Table A6), we decided to use the teachers' ratings as estimates for the 34 fourth graders' MEAP scores. The results with this adjustment are provided in Table 13 and Figures 7 and 8.

Table 13. Grade 4: Academic Performance by Group (with 34 estimated scores included)

Subject	Group	Level of Academic Performance			Significance of Group Difference	
		Satisfactory on MEAP	Not Satisfactory on MEAP	Held Back	Background Unadjusted	Background Adjusted
Mathematics	MSRP	178 (55.1%)	99 (30.7%)	46 (14.2%)	$p < .05$	$p < .05$
	No-program	116 (47.4%)	75 (30.6%)	54 (22.0%)		
Literacy	MSRP	142 (44.0%)	135 (41.8%)	46 (14.2%)	$p < .05$	$p < .05$
	No-program	87 (35.5%)	104 (42.5%)	54 (22.0%)		

Note. Teachers' rating for 34 participants were used to estimate their probable MEAP results, with agree/strongly agree on grade-level mathematics/literacy skills as satisfactory, and disagree/strongly disagree as not satisfactory. Multinomial logistic regression was used for program-effect tests with key background adjustments. n = 568 (95%) for unadjusted analysis and 443 (74%) for adjusted analysis.

Figure 7. Mathematics Performance at Grade 4 by Group

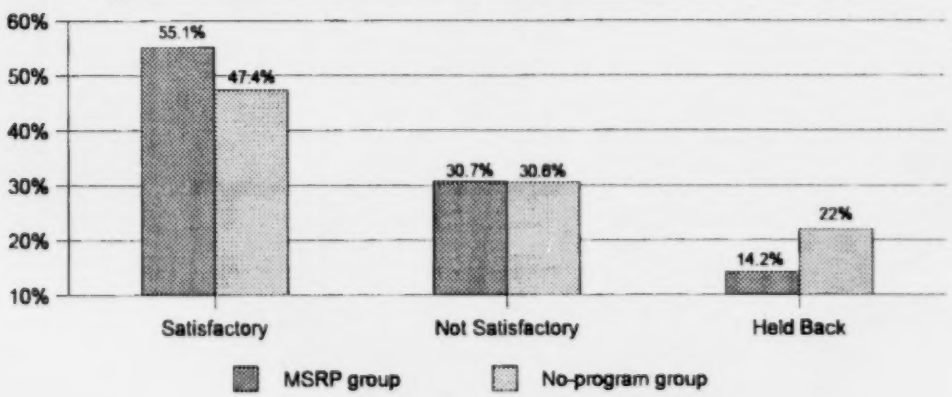
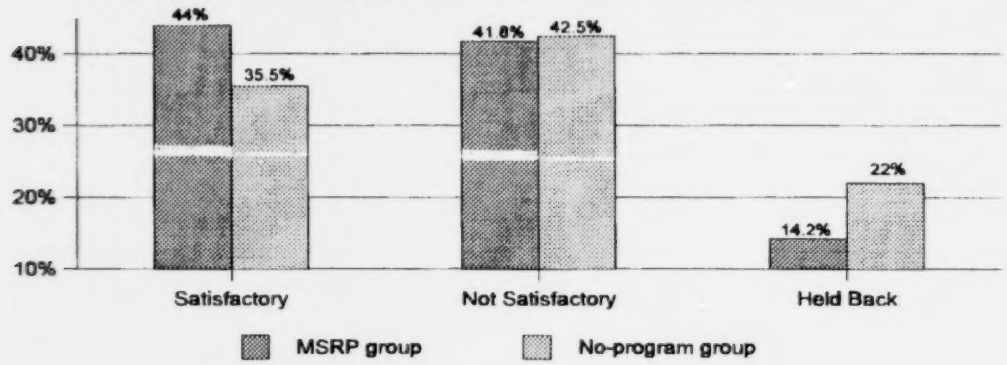


Figure 8. Reading Performance at Grade 4 by Group



The figures indicate that the two groups had almost equal percentages of participants with unsatisfactory scores for mathematics and literacy. The major difference between the two groups is that more MSRP than comparison children achieved satisfactory academic performance, and fewer MSRP than comparison children were held back a grade. In view of the fact the held-back rate for the MSRP group was 35% lower than the no-program group (14.2% vs. 22.0%), the pattern as demonstrated in the figures could also imply that the MSRP helped 35% of its otherwise-held-back students to raise their academic performance to a satisfactory level at fourth grade.

MSRP and Special Services Children Received From Kindergarten Through Grade 4

No major difference was found between the MSRP and no-program groups in the amount of services received in special education, consultancy from reading specialist, or for learning disabilities over the 5 years. The MSRP group was found to have received significantly more compensatory education than the no-program group (see Table 14). However, the data show that some whole schools, rather than individuals, received the compensatory education. All study participants in 12 schools were found to have received compensatory education at grade 4 without exception. Among the 101 study participants in these 12 schools, 70% were MSRP students and 30% were no-program students. The fact that funds for compensatory education are sometimes granted for whole schools suggests that the MSRP participants probably received more

compensatory education because of the more disadvantaged schools they attended, rather than because of their individual performance.

Table 14. Special Services Received by Group

Services Received	Group	Frequency of Receiving Services			Significance of Group Difference	
		Never	Once	Twice or More	Background Unadjusted	Background Adjusted
Compensatory Education	MSRP	156 (46.1%)	88 (26.1%)	94 (27.8%)	$p < .05$	$p < .01$
	No-program	119 (47.8%)	84 (33.7%)	46 (18.5%)		
Special Education	MSRP	285 (84.6%)	25 (7.4%)	27 (8.0%)	—	—
	No-program	220 (88.7%)	17 (6.9%)	11 (4.4%)		
Reading Specialist	MSRP	287 (85.2%)	41 (12.2%)	9 (2.7%)	—	—
	No-program	215 (86.3%)	30 (12.0%)	4 (1.6%)		
Learning Disability	MSRP	305 (90.5%)	24 (7.1%)	8 (2.4%)	—	—
	No-program	234 (94.4%)	11 (4.4%)	3 (1.2%)		

Note. "–" = not significant. *N* varies between 585 to 587 (98% of the study sample), among them 53% having data for 5 years, 14% for 4 years, 12% for 3 years, 10% for 2 years, and 11% for 1 year.

MSRP and Parent Involvement and Expectations

Parents whose children had participated in the MSRP were significantly more involved in school activities and communication with teachers during the first 3 years of school than were similar parents whose children had not participated in the program. Of the six subscales of parent involvement and expectations listed in Table 15, group differences were found for three after controlling for the influence of *study site* and *family socioeconomic status*. The results shown in Table 15 are presented as standard *Z* scores, which were employed for the purpose of combining the 3 years of data on the same scale to achieve the largest possible sample size.

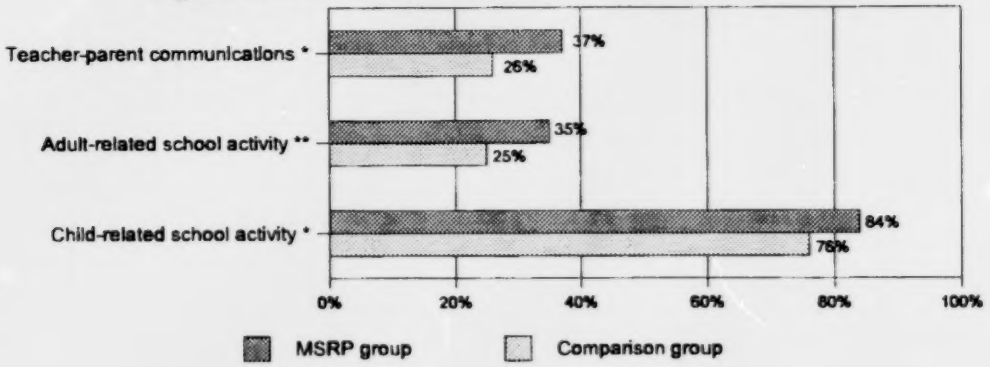
Table 15. K–2: Parent Involvement and Expectations by Group

Subscale	Group	Mean[2] (*SD*)	Significance of Group Difference	
			Background Unadjusted (n = 437)	Background Adjusted (n = 374)
Involvement in child-related school activity[1]	MSRP	.07 (1.06)	$p < .01$	$p < .05$
	No-program	- .20 (.94)		
Involvement in adult-related school activity[1]	MSRP	.08 (1.11)	$p < .01$	$p < .01$
	No-program	- .18 (.79)		
Teacher-parent communication[1]	MSRP	.02 (1.05)	$p < .10$	$p < .05$
	No-program	- .17 (.90)		
Child-related home activities[1]	MSRP	- .02 (1.04)	—	—
	No-program	- .18 (1.03)		
Expectations for child's highest year of education[1]	MSRP	.07 (.95)	$p < .05$	—
	No-program	- .14 (1.07)		
Expectations for child performance next year[1]	MSRP	- .03 (1.01)	—	—
	No-program	- .05 (1.02)		

Note. "–" = not significant.
[1]See the text for operational definitions of the subscale.
[2]The original scores were standardized as *Z* scores on the basis of each year's sample instead of one overall sample, each year's mean = 0 and standard deviation = 1. 437 is 72% of the study sample, 374 is 63%.

Figure 9 shows that in *teacher-parent communications* (parent conferences, parent and teacher talking to each other about the child, and receiving and sending notes/phone calls from each other), 37% of the MSRP parents were involved once a month or more, compared to 26% of the non-MSRP parents. In *adult-related school activities* (PTA, parent education workshop, parent-to-parent outreach, newsletter distribution, and fundraising), 35% of the MSRP parents participated more than once every 4 months, compared to 25% for the non-MSRP parents. In *child-related school activities* (special events, field trips, classroom observations/assistance, helping with food/materials, and making presentations to the class), 84% of the MSRP parents were involved more than once every 2 months, compared to 76% of the non-MSRP parents.

Figure 9. K-2: Parent Frequent Involvement by Group



Note. The results of the tests for group difference were based on the background-adjusted analysis. * = $p < .05$; ** = $p < .01$. *Frequent involvement in child-related school activity* = more than once every 2 months. *Frequent involvement* in *adult-related school activity* = more than once every 4 months. *Frequent involvement in teacher-parent communications* = once a month or more.

However, no consistent program effects were found for parent involvement in child-related home activities (reading to child, listening to child reading, helping with homework, and visiting library/museum) or in parents' expectations for their children's education, in the long run (highest years of education) or short-run (performance in the next school year).

Relationship Between Parent Involvement and Children's School Readiness

As presented above, the MSRP was found to be associated with more parent involvement in school activities and communications with teachers. Did these types of parent involvement help to enhance children's school readiness? Table 16 present the correlation coefficients between parent involvement and child school readiness.

Table 16. Correlations Between Parent Involvement and Child School Readiness Outcomes

Child Outcomes	Grade/ Subject	Parent Involvement and Expectations					
		Child-Related Activity	Adult-Related Activity	Teacher-Parent Communication	Home Activity	Expectation for Schooling	Expectation for Next Year
Ready to learn factor scores (n = 340 to 354)	K			-.12*		.14**	.36**
	1			-.21**		.19**	.29**
	3			-.17**		.17**	.40**
	4		.11*	-.11**		.21**	.31**
Social relations factor scores (n = 340 to 354)	K	.11*			.15**		.11*
	1	.18**	.13*	-.17**			
	3	.11*	.14**		.12*		.14*
	4	.14**		-.16**			.12*
Held-back status (n = 417 to 429)	1						-.19**
	2						-.14**
	3						-.13**
	4		-.11*				-.20**
Academic performance (n = 417 to 420)	Mathematics		.13**			.13**	.25**
	Reading		.12*			.16**	.29**

Note. The empty cells indicate that the correlation coefficients are not significantly different from 0.

As shown, parent involvement in school activities (child- or adult-related) were positively related to children's social relations scores across the years, and with their academic performance at grade 4. But the correlations were weak. In contrast, teacher-parent communications were found to be *negatively* correlated with children's school readiness and social relations scores

across years. Students who had more problems in school readiness or social relations tended to have more communications between teachers and parents. Because of the low correlation coefficients between children's school readiness outcomes and the various types of parent involvement that were found to be affected by the MSRP, and also because of the small sample size with complete data, no further analysis to identify direct and indirect effects was conducted.

Although the MSRP was not found to be associated with parents' expectations for their child's education, it is worth noting, as shown in Table 16, that there is a relatively strong relationship between parent expectations for their child's next-year performance and children's school readiness.

Summary of the Major Findings

The MSRP class of 1995–1996 was found to have good-quality programs. Five major findings serve as evidence of program effects on children's school readiness:

- MSRP participants were significantly higher in overall development at kindergarten than the students who had not participated in the program.
- From kindergarten through grade 4, MSRP participants were rated significantly more ready to learn than the children who had not participated inthe program.
- MSRP participants had a significantly lower rate of being held back a grade from grade 2 through grade 4, compared to the children who had not participated in the program.
- MSRP participants had a significantly higher percentage of satisfactory scores on the MEAP tests for both reading and mathematics when those held back a grade were taken into account.
- Parents of MSRP participants were significantly more involved in school activities and communication with teachers during the first 3 years of school, compared with similar parents whose children had not participated in the program.

Among the indicators evaluated in the study, no MSRP effects were found on reducing special services received by the participants, or enhancing parents' involvement in home activities and expectations for their child's education.

Conclusion

For 5 years, from kindergarten through grade 4, the study compared a group of 1995–1996 MSRP participants to a group of no-program students of similar age and socioeconomic background. The results of the study provide strong evidence for MSRP effects in enhancing the participants' overall development at kindergarten, promoting their school adjustment from kindergarten through grade 4, reducing their rate of being held back a grade by 35 to 45%, and improving their academic performance through grade 4. There is no evidence that program effects have been fading in teacher-rated *ready to learn* scores over the 5 years, although the gap of grade repetition rates between the two groups narrowed slightly at grade 4. The MSRP was also found to have positive effects on parents' involvement in school activities and communications with teachers.

Although the comparison-group design of the study provided a solid base for the fair comparison of the two study groups in terms of child age, gender, and socioeconomic status, it has limitations in controlling for the parents' motivation to be involved in the MSRP, which might be associated with other school-readiness-related factors, such as child developmental level or parents' beliefs and practices supporting their child's education. Initial assessment of these variables would have added more control in this respect, but the implementation of such assessment would have required more resources.

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Appendix

The appendix reports three procedures and analyses to minimize missing data and two additional tables (Table A5 and A6) to justify the use of two indicators in the main text.

Procedures to Minimize Missing Data on Grade-Level Status

Grade-level status (held back or not) for 118 missing participants was added in the last year of the study based on two assumptions. We assumed a previously missing participant to be at grade 4, if his or her name was in the state's fourth graders' MEAP file. Since grade 4 was the highest grade for the study participants who had never repeated a grade, we further assumed a fourth grader's status for any of the previous years to be not held back as well. This procedure provided data for 101 participants that had been missing previously. The second assumption was based on the fact that no study participants who had once been held back were later found to be at the same grade level as those who had never been held back. Therefore, we assumed previously held-back participants to still be behind in the subsequent years, even though their grade-level data had been missing since then. This assumption helped to minimize 17 held-back participants' missing data in their later years. In total, the number of participants included in the updated analyses of held-back rates from grade 1 through grade 4 increased by 20 percentage points, to 95%–98% of the study sample.

Compiling Parent Variables From Three Years of Data

Beginning in the kindergarten year, parent interviews were conducted each year for 3 consecutive years in order to collect data on parent involvement and expectations. The data were very difficult to collect for a variety of reasons: unavailability of phone numbers, no answers despite many calls, avoidance or refusal, disconnections because of moving, and other reasons. The sample sizes were 30%, 44%, and 52% for kindergarten, grade 1, and grade 2 respectively. Given the relatively incomplete parent data set for any single year, we decided to combine the 3 years of data.

Table A1 shows that the levels of parents' expectations and involvement in their children's education remained quite stable across these 3 years. Therefore, it was valid to derive the parents' level of expectations and involvement from any one of the 3 years of available data.

The advantage of this approach is that a much higher proportion of the sample could be obtained to test for potential MSRP effects on parents. As a result, the derived data set had 433 children in all (307 from grade 2, 81 from grade 1, and 45 from kindergarten) – fully 73% of the study sample – a much larger sample size than for any single year.

Table A1. K–2: Results of Analysis of Within-Subject Effects for Parent Involvement and Expectations Using Subscale *Z* Scores Across 3 Years

Subscale	Grade	Mean[1] (*Z* score)	*SD*[1] (*Z* score)	Significance for Within-Subject Effects
Involvement in child-related school activities	K	.14	.94	$p = .96$
	1	.10	1.08	
	2	.11	.96	
Involvement in adult-related school activities	K	-.00	.92	$p = .23$
	1	.06	.78	
	2	.01	.99	
Teacher-parent communication	K	.07	.96	$p = .07$
	1	.10	1.06	
	2	-.17	.93	
Child-related home activities	K	.14	.95	$p = .95$
	1	.11	.84	
	2	.13	1.03	
Expectations for child's highest year of education	K	.01	.98	$p = .98$
	1	-.02	.99	
	2	-.01	.95	
Expectations for child performance next year	K	.09	.92	$p = .15$
	1	.13	.95	
	2	-.12	1.05	

Note. $n = 72$, *SD* = standard deviation.

[1]The subscale scores were standardized on the basis of each year's sample (n =179 for kindergarten, 264 for grade 1, and 305 for grade 2), so that each year's mean = 0 and standard deviation = 1.

As shown in Table A2, the derived parent data set has a well-balanced distribution of participants across the six study sites, and the ratios of the MSRP and no-program groups were similar to those in the original study sample.

Table A2. Number of Participants in the Original and Derived Parent Data Sets, by Group and Site

Site	MSRP Group			No-Program Group			Total Sample		
	Derived	Original	%	Derived	Original	%	Derived	Original	%
COOR	40	45	89	32	44	73	72	89	81
Detroit	47	52	90	35	53	66	82	105	78
Port Huron	53	63	84	35	46	76	88	109	81
Kalamazoo	31	53	58	19	38	50	50	91	55
Muskegon	54	75	72	26	37	70	80	112	71
Wyoming	35	50	70	26	40	65	62	90	69
Total	260	338	77	173	258	67	433	596	73

Compiling Socioeconomic Variables From Two Years of Data

Family background variables were originally collected in kindergarten. Due to the amount of missing data, they were re-collected at grade 2. Because the data collected at grade 2 described socioeconomic conditions 3 years later, they were compared with those collected at kindergarten to check for consistency. No major differences were found for most of the socioeconomic variables, but a striking discrepancy was detected in average annual household income ($29,015 for grade 2 vs. $17,432 for kindergarten) This increase was due to the improvement in Michigan's economy and to additional improvements in families' incomes during these years, mainly because mothers started working.

The discrepancy in the 2 years' household incomes indicated that some adjustments had to be made to set up a unified scale. Because kindergarten data were more abundant, they served as the base to which the additional data were adjusted. Thus, the income data for 91 cases were adjusted to the kindergarten income data already available for 393 cases.

The approach we employed for the estimation of kindergarten income had four steps: First, we calculated the *increased amount of income* between kindergarten and grade 2 for the participants who had both years' information. Second, we found out which socioeconomic factors

were related to the *increased income*. Third, based on the relationship between the *increased income* and other socioeconomic factors, we estimated the *increased amount of income* for the participants who had only grade 2 data. Fourth, we removed the *estimated increased amount* from grade 2 income to estimate the kindergarten income.

To begin the estimation process, a regression analysis was conducted for 198 participants who had data for both years. The results indicated that three family socioeconomic factors were associated with the increased income from kindergarten to grade 2: *father's at home status* (fathers at home at grade 2 had greater income increases); *parents' total years of working during the period* (the more years the parents worked during the period, the more their income increased); and *mother's additional years of education during the period* (the more years of additional education mothers had during the period, the more their income increased). With these three variables and the Michigan inflation rates for these years taken into account, estimation of the kindergarten income was made for the 91 participants from their grade 2 family income data.

To examine the effects of the estimation, the reported family income of kindergartners was compared with their estimated family income as shown in Table A3, and the correlations between the reported income and child outcomes were compared to the correlations between the estimated income and the child outcomes as shown in Table A4.

Table A3. Reported Versus Estimated Family Income at Kindergarten

Source of Kindergarten Income Data	*n*	Mean	*SD*	Statistical Significance
Reported	186	$19,457	$11,938	
Estimated	91	$20,171	$14,292	$p > .05$

Note. Data from 2 sites are not included in the reported data, because no estimated data are available for these sites. *SD* = standard deviation.

Table A4. Correlations of Reported and Estimated Income With SRRS Total Scores

Type of income	Kindergarten SRRS		Grade 1 SRRS		Grade 2 SRRS		Grade 3 SRRS	
	n	*r*	*n*	*r*	*n*	*r*	*n*	*r*
Reported	324	.17**	291	.29**	226	.23**	272	.20**
Estimated	71	.17	83	.21	51	.34*	74	.29*

Note. Scores are averages of all items on the School Readiness Rating Scale; *n* = number of cases. *r* = correlation coefficient. * = $p < .05$, ** = $p < .01$.

The similarity of the reported and estimated income means and the similarity of their correlations with school readiness scores provides evidence of the validity of employing the estimated income for further comprehensive analysis of program effects.

The following two tables are presented in the appendix in order to justify the use of the combined scores of the SRRS (Table A5) and teachers' ratings as estimates for the MEAP scores (Table A6).

Table A7 presents the sample status for each study site in terms of all the categories used – (a) students on grade: who had MEAP scores, or who did not have MEAP scores but were in the MEAP file, or who did not have MEAP scores and were not in the MEAP file; (b) students who were home schooled; (c) students who were held back a grade and so did not have grade 4 MEAP scores, but who had other confirming information either this year or previously; and (d) students for whom we have no information.

Table A5. Analysis of Within-Subject Effects for the SRRS Ready to Learn Factor Scores Across Years

Grade	Mean	*SD*	Significance for Within-Subject Effects
K	.03	.96	
1	.05	1.00	$p = .88$
3	.06	.97	
4	.02	.97	

Note. $n = 243$. Grade 2's data were not included due to the different scales used for the held-back and non-held-back students in that year. The factor scores were based on each year's sample (n = 498 for kindergarten, 444 for grade 1, 420 for grade 3, and 438 for grade 4), so that each year's mean = 0 and standard deviation = 1.

Table A6. Correlations Between MEAP Scores and Teachers' Ratings on Mathematics and Reading of the SRRS

MEAP Scores	Teachers' Ratings on SRRS							
	Grade 4		Grade 3		Grade 2		Grade 1	
	Math	Reading	Math	Reading	Math	Reading	Math	Reading
MEAP math	.64**		.53**		.60**		.54**	
MEAP reading		.54**		.48**		.57**		.44**

Note. Grade 4: $n = 335$; grade 3 $n = 320$; grade 2: $n = 277$; and grade 1: $n = 342$.
** = $p < .01$

Table. A7. Cohort 1 Grade 4: Sample Status by Study Site

Site	On Grade				Home Schooled	Retained			No Info	Total
	With MEAP	Without MEAP		Sub-total		Current Info	Prior Info	Sub-total		
		In File	Not in File							
COOR	70	1	4	75	2	14	0	14	8	99
Detroit	74	5	1	80	0	18	6	24	8	112
Port Huron	82	4	5	91	3	10	2	12	6	112
Kalamazoo	72	3	2	77	0	2	1	3	10	90
Muskegon	67	0	1	68	0	30	6	36	8	112
Wyoming	69	2	0	71	1	9	2	11	14	97
Total	**434**	**15**	**13**	**462**	**6**	**83**	**17**	**100**	**54**	**622**

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EFF-089 (1/2003)

P2031191